

Spot Safety Project Evaluation

Project Log # 200712099

Spot Safety Project # 04-01-202

**Spot Safety Project Evaluation of the Traffic Signal Installation
At the Intersection of NC 581 (Sanford St / Oak Ave) and SR 1973 (Main St)
Nash County, Town of Bailey**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

Jason B. Schronce

2-25-2008
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 04-01-202 – The Intersection of NC 581 (Sanford Street / Oak Avenue) and SR 1973 (Main Street) in Nash County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a 2-phase traffic signal. In the study period, NC 581 and SR 1973 (Main Street) are both two-lane, two-way facilities at the subject intersection with no turn lanes and speed limits of 35 mph and 25 mph, respectively. The subject location is a four-leg intersection, which was controlled by a stop signs on NC 581 (Sanford Street / Oak Avenue) in the before period.

The original statement of problem was the developing angle crash pattern. A building in the northwest quadrant (James Finch Chevrolet) restricts sight distance for vehicles entering the intersection. The installation of the signal comes after all other reasonable measures to improve safety were exhausted by the Division Traffic Engineer.

The initial crash analysis was completed from April 1, 1997 to March 31, 2000 with eight (8) reported crashes, six (6) of which were Angle Crashes. The final completion date for the improvement at the subject intersection was on December 2, 2002 with a total cost of \$40,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from November 1, 2002 to December 31, 2002. The before period consisted of reported crashes from March 1, 1998 through October 31, 2002 (4 years and 8 months) and the after period consisted of reported crashes from January 1, 2003 through August 31, 2007 (4 years and 8 months). The ending date for this analysis was determined by the date of available crash data at the time of analysis.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location map, aerial map, and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact Crashes (at the intersection) were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	18	2	- 88.89 %
Total Severity Index	4.29	1.00	- 76.69 %
Target Crashes	17	0	- 100.00 %
Target Crash Severity Index	4.48	0.00	- 100.00 %
Volume			
<u>Injury Crash Summary – Total</u>			
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	1	0	- 100.00 %
Class C Injury Crashes	7	0	- 100.00 %
Total Injury Crashes	8	0	- 100.00 %

The naive before and after analysis at the treatment location resulted in an 89 percent decrease in Total Crashes, complete elimination of Target Crashes, and a 77 percent decrease in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2005.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in an 89 percent decrease in Total Crashes and complete elimination of Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagram*, the majority of crashes at the intersection in the before period (17 of 18) were the result of a vehicle improperly entering the intersection or running the stop sign from NC 581. After the signal installation, this pattern was completely eliminated along with all injury crashes.

There was one Rear-End Crash at the intersection in the after period. The second after period crash was random in nature caused by a tractor-trailer that cut their turning radius to short and impacted a vehicle stopped on the opposite approach.

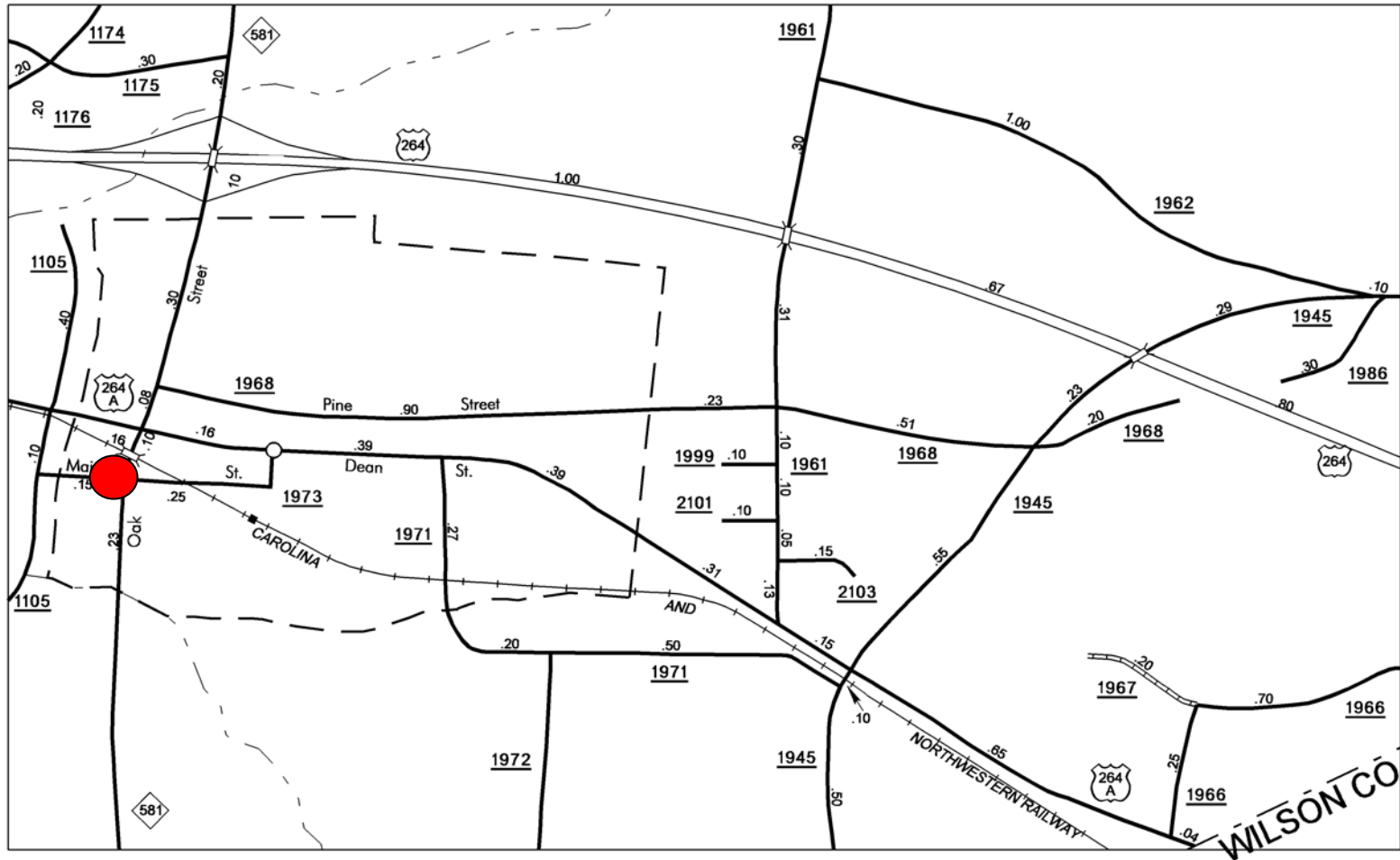
The calculated benefit to cost ratio for this project is 4.23 considering total crashes. The benefit to cost ratio considering only target crashes is 4.33. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection. One photo is also provided showing the railroad overpass that is located

approximately 215 feet north of the subject intersection. During the study period examined in this report, twenty-six (26) low clearance collisions occurred at this railroad bridge.

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

Location Map
Nash County, Town of Bailey
Evaluation of Spot Safety Project # 04-01-202



BAILEY
POP. 681

Treatment Location: NC 581 (Sanford Street / Oak Ave) at SR 1973 (Main Street)

SS# 04-01-202 Aerial Map



TREATMENT SITE PHOTO TAKEN 2/7/2008



Traveling East on SR 1973 (Main Street)



Traveling West on SR 1973 (Main Street)



Traveling North on NC 581 (Sanford Street)



Traveling South on NC 581 (Oak Avenue)



Railroad Bridge – approximately 215' north of intersection

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC-581 at Main Street
COUNTY: Nash - Town of Bailey
FILE NO.: SS 04-01-202

BY: JBS
DATE: 2/20/2008
NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$40,000	10	0.149	\$5,961
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$40,000	10	0.149	\$5,961
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ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$900
TOTAL ANNUAL COST=	\$8,861
TOTAL COST OF PROJECT=	\$40,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.67	0	0.00	8	1.71	10	2.14	\$39,186
AFTER	4.67	0	0.00	0	0.00	2	0.43	\$1,670

Annual Benefits from Crash Cost Savings \$37,516

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$28,655

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 4.23

TOTAL COST OF PROJECT - \$40,000 COMPREHENSIVE B/C RATIO - 4.23

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 581 at Main
COUNTY: Nash (Town of Bailey)
FILE NO.: SS 04-01-202

BY: JBS
DATE: 2/20/2008
NOTES: Target Crashes - Frontal Impact at Intersection

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$40,000	10	0.149	\$5,961
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$40,000	10	0.149	\$5,961
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ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$900
TOTAL ANNUAL COST=	\$8,861
TOTAL COST OF PROJECT=	\$40,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

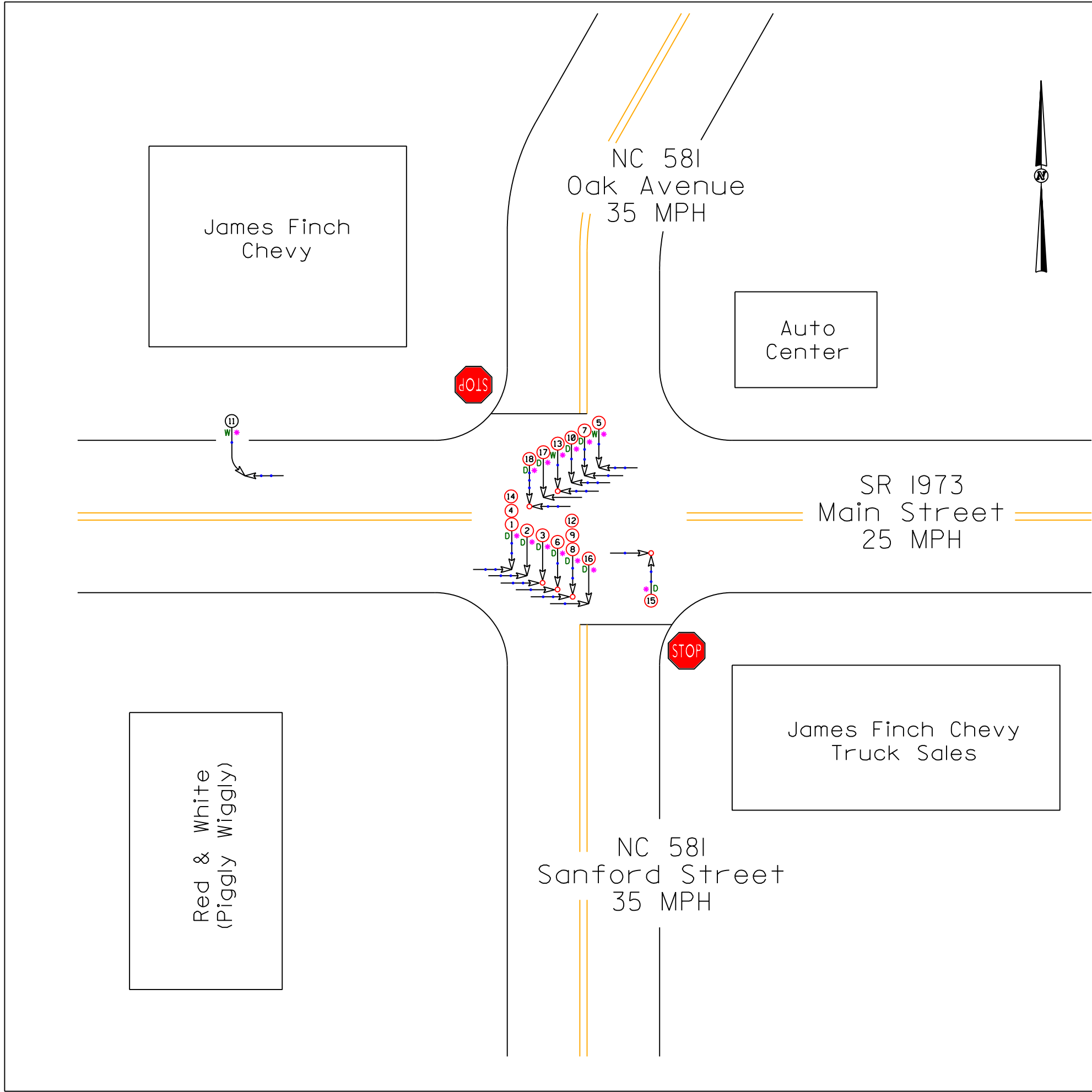
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.67	0	0.00	8	1.71	9	1.93	\$38,351
AFTER	4.67	0	0.00	0	0.00	0	0.00	\$0

Annual Benefits from Crash Cost Savings \$38,351

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$29,490

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 4.33

TOTAL COST OF PROJECT - \$40,000 COMPREHENSIVE B/C RATIO - 4.33



LEGEND					
	MOVING VEHICLE		ANGLE		9 MPH OR LESS
	PEDESTRIAN		TURNING		10 MPH TO 19
	PARKED VEHICLE		BACKING		20 MPH TO 29
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49
	HEAD ON		INJURY		50 MPH TO 59
	REAR END		FATALITY		60 MPH TO 69
	RAN OFF ROAD		SPEED UNKNOWN		70 AND UP
					P PEDESTRIAN
					T TRAIN
					• DRIVER AT FAULT
					D DRY
					W WET
					I ICY OR SNOWY
					O ONLY

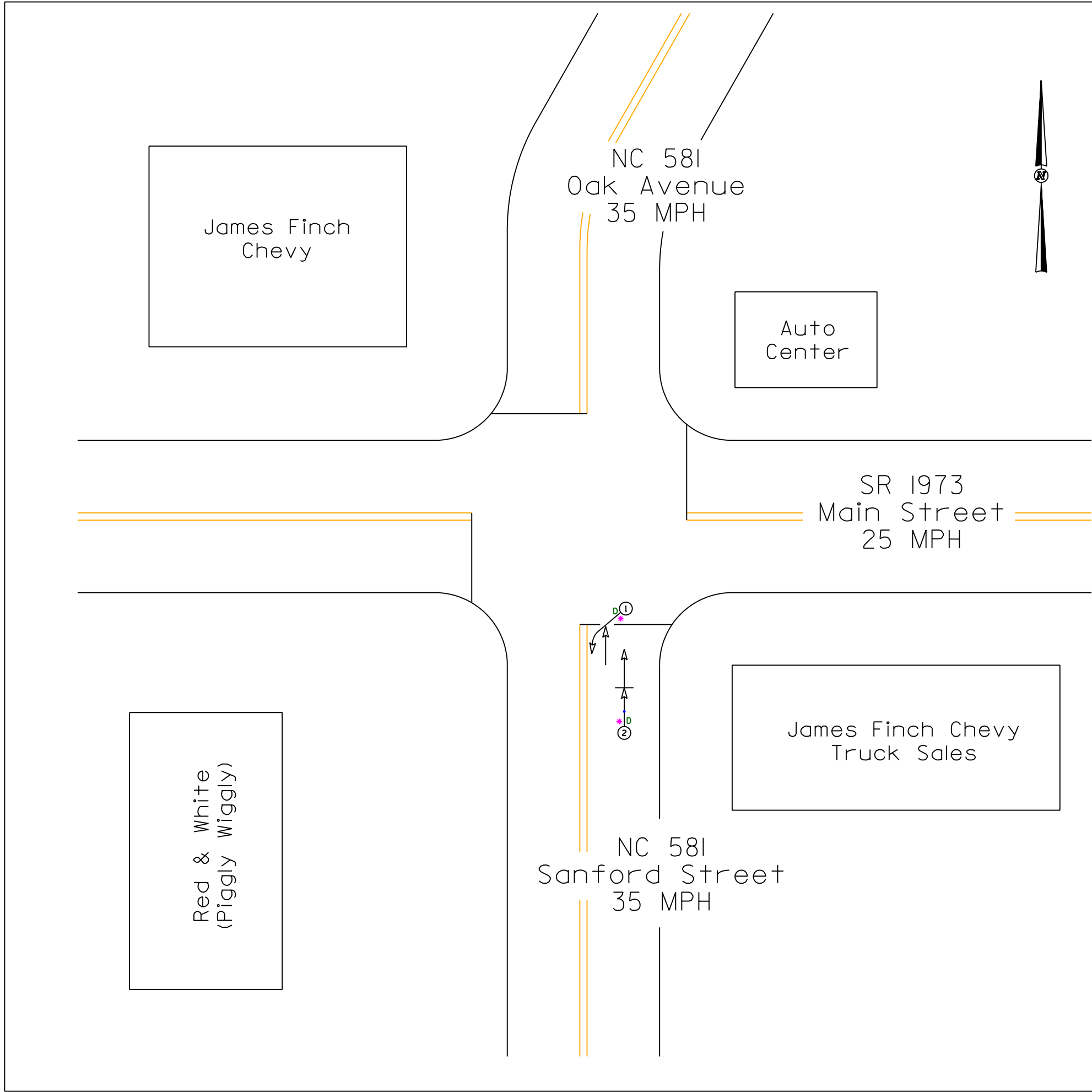
SS# 04-01-202
Nash County
Town of Bailey
BEFORE Period
3/1/98 - 10/31/02
NC 581 at Main St

⊕ Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 4	AREA: 2
STUDY PERIOD: 3/1/1998 - 10/31/2002	
DISTANCE:	Y-LINE = 150FT
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 2-19-2008	
LOG NUMBER: SS# 04-01-202	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH



LEGEND					
	MOVING VEHICLE		ANGLE		9 MPH OR LESS
	PEDESTRIAN		TURNING		10 MPH TO 19
	PARKED VEHICLE		BACKING		20 MPH TO 29
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49
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	REAR END		FATALITY		60 MPH TO 69
	RAN OFF ROAD		SPEED UNKNOWN		70 AND UP
					P PEDESTRIAN
					T TRAIN
					• DRIVER AT FAULT
					D DRY
					W WET
					I ICY OR SNOWY
					O ONLY

SS# 04-01-202
Nash County
Town of Bailey
AFTER Period
1/1/03 - 8/31/07
NC 581 at Main St



New Signalized
Intersection



Target Crashes

COLLISION DIAGRAM	
DIVISION: 4	AREA: 2
STUDY PERIOD: 1/1/2003 - 8/31/2007	
DISTANCE:	Y-LINE = 150FT
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 2-19-2008	
LOG NUMBER: SS* 04-01-202	

N.C. DEPARTMENT of TRANSPORTATION
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SYSTEMS BRANCH